

(For the students of B.Sc., Zoology and B.Sc. Chemistry Courses
Admitted from 2026-2027 onwards)

Year: I

Semester: I

ALLIED BOTANY - I

Code:

(THEORY)

Credits: 4

COURSE OBJECTIVES:

- To relate major groups of plants and their characteristics.
- To compare the structural and reproductive stages of major groups of plants with an appropriate type study.
- To categorize the life cycle patterns of major groups of plants.
- To analyse basic principles of anatomy of higher plants.
- To understand the developmental stage of embryology

UNIT I ALGAE, FUNGI AND LICHEN:

Structure, reproduction and life cycle of the following groups:

Algae: *Oscillatoria*, *Chlamydomonas*, *Caulerpa*, *Sargassum* and *Gracilaria*;
Fungi: *Penicillium* and *Agaricus*; Lichens: Components and types,
Structure and reproduction of *Usnea*.

UNIT II BRYOPHYTES AND PTERIDOPHYTES:

Study of the Structure, reproduction and life cycle of the following groups:

Bryophytes: *Marchantia* and *Funaria*; *Pteridophyta*: *Lycopodium* and *Nephrolepis*

UNIT III GYMNOSPERMS AND PALAEOBOTANY:

Gymnosperms: Structure, reproduction and life cycle of *Cycas* and *Gnetum*;

Palaeobotany: Fossils, Types (compressions, impressions, petrifications, coalballs);

Detailed study of morphology and reproduction in *Rhynia* and *Williamsonia*

UNIT IV PLANT ANATOMY:

Anatomy: Tissues – Classification of plant tissues - Simple and Complex tissues
Anatomy of Dicot and Monocot root, stem and leaf
Normal Secondary thickenings: Dicot Stem and Monocot Stem.

UNIT-V PLANTEMBRYOLOGY:

Embryology: Mature anther, Microsporangium and male gametophyte.
Megasporangium- Types of ovules and Female gametophyte (*Polygonum* type), Double fertilization, Types of endosperms, Structure and development of dicot embryo.

UNIT-VI CURRENT CONTOURS (For continuous internal assessment only):

Current developments related to the Plant Diversity, Anatomy and Embryology during the semester concerned to be kept abreast of continuously and cumulatively through collection, discussion and evaluation from news and events over the world collected through multiple reliable informative sources—Research articles, review materials, print, Internet, Interaction, social media, Webinars and so on.

Recommended Textbooks:

1. Pandey, B.P. (2001). College Botany Vol. I: Algae, Fungi, Lichens, Bacteria, Viruses, Plant Pathology, Industrial Microbiology and Bryophyta. S. Chand & Company Ltd., New Delhi.
2. Sharma, P. D (2003). The Fungi. Rastogi Publications, Meerut
3. Gangulee & Khar, 1980. College Botany Vol. I & II Tata Mc Graw Hill, New Delhi.
4. Vashishta, P.C, Sinha and Anilkumar (2010). Pteridophytes, S. Chand & Company Ltd, New Delhi.
5. Pandey, S. N., Misra, S. P and Trivedi, P.S. 1970. A textbook of Botany (Vol II). Vikas Publishing House Pvt. Ltd. Delhi.
6. Pandey B, P. (2015), Plant Anatomy S. Chand Publ. New Delhi.

Reference Books:

1. Kirkaldy, J. E. (1963). The study of Fossils. Hutchinson Educational, London.
2. Vashista P.C. (1984). Plant Anatomy—Pradeep publication, Jalandhar
3. Bhojwani, S.S. and Bhatnagar, S.P. (2011). The Embryology of Angiosperms, 5th Edition, Vikas Publishing House. Delhi.
4. Pandey, A. K (2000). Introduction to Embryology of Angiosperms 1st Edition: CBS; New Delhi.

Web Resources:

1. [https://gurukpo.com/Content/B.Sc./Algae_Lichens_and Bryophyta.pdf](https://gurukpo.com/Content/B.Sc./Algae_Lichens_and_Bryophyta.pdf)
2. <https://www.austincc.edu/ddingley/MLAB1331/LectureGuide/Mycology.pdf>
3. [https://bio.libertexts.otg/Bookshelves/Botany/Book%3A_Introduction_to_Botany_\(Shipunov\)/06%3A_Growing_Diversity_of_Plants/.02%3A_Pteridophyta_the_Ferns](https://bio.libertexts.otg/Bookshelves/Botany/Book%3A_Introduction_to_Botany_(Shipunov)/06%3A_Growing_Diversity_of_Plants/.02%3A_Pteridophyta_the_Ferns)

4. <https://www1.biologie.uni-hamburg.de/b-online/palbot/teach/palbotteach.html>

5. <https://www.google.com/search?q=neela+bakore+reproduction+in+flowering+plants>

6. <http://virtualplant.ru.ac.za/Main/ANATOMY/prac5.htm>

COURSE OUTCOMES:

Course Outcomes	On successful completion of this course, the students will be able to	Cognitive Level
C01	Explain and evaluate the distinguishing characteristics, diversity, and evolutionary significance of major plant groups and assess their ecological importance.	K1
C02	Compare, classify, and evaluate the organizational and reproductive features of different plant groups and interpret their taxonomic significance.	K2
C03	Examine, analyze and interpret the life cycle patterns and reproductive strategies of various plant groups and evaluate their evolutionary adaptations.	K3
C04	Investigate and evaluate the anatomical organization of plants and assess the relationship between structure and function in plant growth and development.	K4
C05	Analyze and evaluate the principles of plant embryology and assess their applications in plant reproduction, breeding, biotechnology, and crop improvement.	K5

Mapping with POs:

Relationship Matrix											
Semester	Course Code	Title of the Course								Hours	Credits
I		Allied Botany I (Theory)								4	4
Course Outcomes	Programme Outcomes (POs)										Mean Score
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	
C01	1	3	3	2	3	1	2	2	2	1	2.0
C02	1	3	3	3	3	1	2	2	2	1	2.1
C03	1	3	3	3	3	1	2	3	2	1	2.2
C04	1	3	3	3	3	1	2	2	3	1	2.2
C05	1	3	3	3	3	1	2	3	3	1	2.3
Mean Overall Score											2.16 (High)

Year: I

Semester: I & II

ALLIED BOTANY PRACTICAL - I

Code:

Credit: 4

COURSE OBJECTIVES:

- To develop practical skills in the identification and classification of algae, fungi, bryophytes, pteridophytes, and gymnosperms.
- To understand the anatomical features of dicot and monocot root, stem, and leaf through sectioning and microscopic analysis.
- To study the developmental stages of microsporangia, megasporangia, ovules, and embryos in plants.
- To acquire knowledge of floral morphology, floral formula, floral diagram, and identification of angiosperm families.
- To perform basic experiments related to plant physiology and interpret the results scientifically.

ALLIED BOTANY PRACTICAL:

1. To demonstrate preparations of Algae, Fungi, Bryophytes, Pteridophytes, Gymnosperms (mentioned in the syllabus) and to describe and identify the same.
2. To construct micro preparations of the stem, root and leaf of dicot and monocot and to identify the same giving reasons.
3. To prepare suitable micro preparations and detailed microscopic analysis of Dicot Stem Monocot Stem.
4. To record the developmental stages of micro and megasporangia.
5. To analyses the different types of ovules and endosperms
6. To describe the plants in technical terms and to identify the family by the observed morphological characters of vegetative and floral parts.
7. To dissect the flower and to construct the floral diagram.
8. To critically comment the experimental set-ups in plant physiology.
9. To demonstrate the ecological groups of plants (morphological and anatomical adaptations)

Recommended Textbooks:

1. College Botany Vol. I – Pandey, B.P. (2001). S. Chand & Company Ltd., New Delhi.
2. College Botany Vol. I & II – Gangulee & Kar (1980). Tata McGraw Hill, New Delhi.
3. Plant Anatomy – Pandey, B.P. (2015). S. Chand Publications, New Delhi.
4. Taxonomy of Angiosperms – Pandey, B.P. (1997). S. Chand & Co., New Delhi.
5. Fundamentals of Plant Physiology – Jain, V.K. (2007). S. Chand & Company Ltd., New Delhi.
6. Ecology and Environment – Sharma, P.D. (2009). Rastogi Publications.

Reference Books:

1. Plant Anatomy – Vashishta, P.C. (1984). Pradeep Publications, Jalandhar.
2. Introduction to Embryology of Angiosperms – Pandey, A.K. (2000). CBS Publishers, New Delhi.
3. Plant Physiology and Development – Taiz, Lincoln; Zeiger, Eduardo; Møller, Ian M.; Murphy, Angus. Sinauer Associates.
4. Plant Ecology and Soil Science – Shukla, R.S. & Chandel, P.S. (1991). S. Chand & Co., New Delhi.

COURSE OUTCOMES:

Course Outcomes	On successful completion of this course, the students will be able to	Cognitive Level
CO1	Classify and evaluate algae, fungi, bryophytes, pteridophytes, gymnosperms, and angiosperms using their morphological, anatomical and reproductive characteristics.	K1
CO2	Demonstrate proficiency in the preparation, observation, analysis and identification of temporary and permanent microscopic slides using standard laboratory techniques.	K2
CO3	Investigate, compare, and evaluate the anatomical organization of dicot and monocot roots, stems, and leaves and correlate structural features with their functional significance.	K3
CO4	Interpret, analyze and evaluate experimental observations and results related to plant physiology, ecology, embryology, genetics, biotechnology and allied biological sciences.	K4
CO5	Apply and integrate practical skills in taxonomy, tissue culture, genetic engineering, scientific documentation, data recording and laboratory practices for biological investigations and research.	K5

Mapping with POs:

Relationship Matrix											
Semester	Course Code	Title of the Course								Hours	Credits
I & II		Allied Botany Practical I (Practical)								2 + 4	4
Course Outcomes	Programme Outcomes (POs)										Mean Score
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	
CO1	2	3	3	3	3	1	2	2	3	1	2.3
CO2	2	3	2	3	3	2	1	2	3	1	2.2
CO3	2	3	3	3	3	1	2	2	3	1	2.3
CO4	2	3	3	3	3	2	2	3	3	1	2.5
CO5	2	3	3	3	3	2	2	3	3	2	2.6
Mean Overall Score											2.38 (High)

Year: I

**ALLIED BOTANY II
TAXONOMY, PHYSIOLOGY, ECOLOGY AND
BIOTECHNOLOGY**

Semester: II

Code:

(Theory)

Credits: 4

COURSE OBJECTIVES:

- To state the basic system of classification and salient features of few families.
- To understand the economic significances of some angiosperm plants.
- To describe the physiological principles of plants.
- To operate the basic mechanism involved in biotechnology.
- To recall the basic principles of ecology

UNIT I TAXONOMY:

Outline of Bentham and Hooker's system of classification. Study of the following families and economic importance of plants included in the families - Annonaceae, Rutaceae, Fabaceae, Cucurbitaceae.

UNIT II TAXONOMY:

Study of the following families and economic importance of plants included in the families: Rubiaceae, Asclepiadaceae, Lamiaceae, Amaranthaceae, Liliaceae and Poaceae.

UNIT III PHYSIOLOGY:

Absorption of water, Absorption of minerals, Photosynthesis - Light and dark reaction. Respiration: Aerobic-Glycolysis, kreb's Cycle, Electron Transport System, Anaerobic - fermentation. Growth hormones - Physiological effects and practical applications of Auxin, Gibberellins and cytokinins.

UNIT IV ECOLOGY:

Basic concepts of Ecosystem Factors affecting Vegetation - Climatic, edaphic and biotic factors. Morphological and anatomical adaptations of - Xerophytes - Nerium and Casuarina. Hydrophytes- Hydrilla and Nymphaea. Mesophytes -Helianthus and Hibiscus.

UNIT V PLANT BIOTECHNOLOGY:

Tissue culture techniques (Basic principles, Aseptic conditions, Media preparation, Callus induction) Genetic Engineering - Basic principles, tools, techniques and applications Transgenic plants - Bt - Cotton.

UNIT-VI CURRENT CONTOURS (For Continuous Internal Assessment Only):

Current developments related to the Taxonomy, Physiology, Ecology and Biotechnology during the semester concerned to be kept abreast of continuously and cumulatively through collection, discussion and evaluation from news and events over the world collected through multiple

reliable informative sources–Research articles, review materials, print, Internet, Interaction, social media, Webinars and so on.

Recommended Textbooks:

1. Pandey, B.P.(1997).Taxonomy of Angiosperms, S.Chand & Co., New Delhi.
2. Samba murthy A.S.S. 2005; Taxonomy of Angiosperms, I.K. International Pvt. Ltd, New Delhi.
3. Plant Taxonomy (2008)–second Edition by OP Sharma, Mc Graw Hill education .
4. Jain, VK (2007).Fundamentals of plant physiology, S. Chand & Compamy ltd, New Delhi.
5. Verma,V(2008).Text book of plant Physiology, Ane’s student edition,New Delhi

Reference Books:

- 1.Plant physiology and development by Lincoln Taiz, Eduardo Zeiger, Ian M. Møller, and Angus Murphy, published by Sinauer Associates
- 2.Sharma, P.D(2009).Ecology and Environment, Rastogi Publications.
- 3.Shukla, R.S. & P.S. Chandel (1991): Plant Ecology& Soil Science, S.Chand & Co., New Delhi.
- 4.Dubey, RC(2004)A text book of Biotechnology-3rdEdition, S.Chand & Company Ltd, New Delhi.
- 5.Kumaresan, V,(2009).“Biotechnology”,Saras Publications, Nagercoil.

Web Resources:

- 1.<http://webapp1.dlib.indiana.edu/inauthors/view?docId=VAC0868&doc.view=print>
- 2.<http://www.auburn.edu/academic/classes/biol/1030/rajamani/topic7%20BIOL1030NR.pdf>
- 3.<https://www.eeob.iastate.edu/classes/bio366/notes.html>
- 4.<https://www.bialigy.com/10-plant-physiology.html>
- 5.<https://www.ohio.edu/plantbio/staff/mccarthy/dendro/ecology.htm>
- 6.<https://www.agrimoon.com/principles-of-plant-biotechnology-icar-ecourse-pdf/>
- 7.http://www.unice.fr/EB/USTH%202013/BP04_introduction_biotechnolog_y_part_1.pdf

COURSE OUTCOMES:

Course Outcomes:	On successful completion of this course, the students will be able to	Cognitive Levels
C01	Explain, Identify and evaluate plants using their morphological, taxonomic and ecological characteristics under field and laboratory conditions.	K1
C02	Compare, contrast, and evaluate the diagnostic characteristics of selected dicot and monocot families and assess their taxonomic significance.	K2
C03	Analyze and interpret fundamental plant physiological processes and evaluate their role in plant growth, development, and adaptation.	K3
C04	Investigate and evaluate ecological principles, plant–environment interactions, and ecosystem dynamics and assess their significance in environmental sustainability.	K4
C05	Analyze and evaluate the principles, techniques, and applications of plant biotechnology and assess their role in crop improvement, conservation, and sustainable development.	K5

Relationship Matrix											
Semester	Course Code	Title of the Course								Hours	Credits
II		ALLIED BOTANY II (Theory)								4	4
Course Outcomes	Programme Outcomes (POs)										Mean Score
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	
C01	2	3	3	3	2	1	2	2	3	1	2.2
C02	2	3	3	3	2	1	2	2	2	1	2.1
C03	1	3	3	3	3	1	2	3	2	1	2.2
C04	1	3	3	3	3	1	3	3	2	1	2.3
C05	1	3	3	3	3	2	2	3	3	2	2.5
Mean Overall Score											2.26 (High)